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# Surface Science

A JOURNAL DEVOTED TO THE PHYSICS AND CHEMISTRY OF INTERFACES

Editor Harry C. Gatos, Cambridge, MA

Regional Editors:

G. Comsa, S. Kawaji, R.F. Willis

Master Index to Volumes 181–190

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ENRICO FERMI INTERNATIONAL SUMMER SCHOOL OF PHYSICS, Volume 96

# Excited-State Spectroscopy in Solids

*edited by* **U.M. Grassano,** *University of Rome, Rome, Italy and* **N. Terzi,** *University of Milan, Milan, Italy*

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The purpose of this course was to review many different aspects of the transient processes related to the excitation of solids. The topics covered include the excitation of electrons and phonons, the energy-transfer and the relaxation. The materials investigated are generally insulating crystals, but the last part of the book deals with less common systems like, fractals, large clusters and biological systems such as the living cell.

The theoretical background and the detailed description of the most recent experimental techniques should be of interest to both theoreticians and experimentalists, graduate students and professional physicists and chemists alike.

*Contents:* Introduction *(U.M. Grassano and N. Terzi)*. Exciton-polariton states in insulators and semiconductors *(F. Bassani and L.C. Andreani)*. Creation, motion and decay of excitons in rare-gas solids *(G. Zimmerer)*. Elementary excitations in diluted magnetic semiconductors *(W. Gebhardt)*. Frequency-dependent phase of reflected light and transient reflectivity near an excitonic resonance in CsSe *(C. Gourdon and P. Lavallard)*. Polarization effects on localized exciton states in solids *(T.O. Woodruff)*. Resonant photoemission in semiconductors *(P. Perfetti)*. Selective pair luminescence in semiconductors *(J.C.M. Henning)*. Phonons and electron-phonon interaction at localized centres *(H. Thomas)*. Phonon pulses: spectroscopic generation and dynamics *(K.F. Renk)*. Nonradiative transfer of optical excitation in ruby *(M. Montagna and G. Villiani)*. Transfer and trapping of optical excitation *(D.L. Huber)*. Excitation, vibrational fluorescence and energy transfer of CN-defect modes in alkali halides *(F. Luty)*. Surface excitations from particle-surface scattering *(G. Benedek)*. High-intensity picosecond laser interaction with semiconductors *(A.M. Malvezzi)*. Picosecond vibrational dynamics of $O_2^-$ in alkali halide hosts *(W.H. Knox)*. High-resolution spectroscopy of organic solids: hole-burning in molecular crystals and amorphous systems at low temperature *(S. Völker)*. Energy transfer in restricted geometries *(J. Klafter, J.M. Drake and A. Blumen)*. Energetics and dynamics of clusters *(J. Jortner, D. Scharf and U. Landman)*. Excitation dynamics in biomolecular systems *(R.S. Knox)*.

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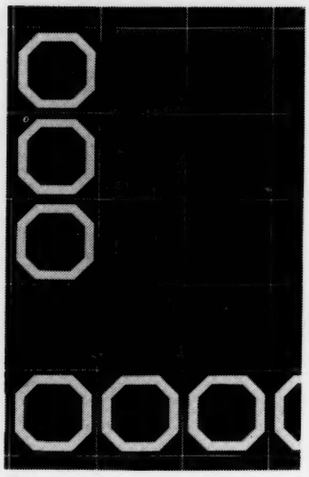

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As in previous volumes in the series, this volume continues the coverage of a wide spectrum of topics.
Recently it has been said that the rare earth elements are destined to play an even greater role in our "high-tech" society in the future than they have in the past. This judgement is based upon the trend of increasing applications resulting from the electronic structures of these materials that lead to their unusual optical, magnetic, electrical and chemical properties so adaptable to the demands now being placed on materials. Four chapters in this tradition comprise the contents of this volume.

The development of lasers containing rare earth species sparked an interest in glasses containing these elements. Reisfeld and Jørgensen discuss excited-state phenomena in vitreous rare earth-containing substances. The description of the chemistry and crystal chemistry of complex inorganic compounds of the rare earths are continued by Niinistö and Leskelä from the previous volume. Here they consider the phosphates, arsenates, selenates and selenites, oxohalogen compounds and vanadates. Encapsulation and transport of charged hydrophilic species from an aqueous medium into a hydrophobic phase are promoted by ionophores. The properties and applications of rare earth complexes with synthetic ionophores are described by Bünzli. Finally, Shen and Ouyang review their own work and that of others in the application of rare earth coordination catalysts in stereospecific polymerization. These Ziegler-Natta type catalysts provide tools for, among other things, the design of electrically conducting polymers.

*Contents:* Preface. Contents of volumes 1-8. Excited state phenomena in vitreous materials *(R. Reisfeld and C.K. Jørgensen)*. Inorganic complex compounds II *(L. Niinistö and M. Leskelä)*. Complexes with synthetic ionophores *(J.-C. Bünzli)*. Rare earth coordination catalysts in stereospecific polymerization *(Zhiquan Shen and Jun Ouyang)*. Errata. Subject Index.

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